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above alluded to, has arrived. Certainly, if we are permitted to have a choice of a name for a united, strong, and comprehensive society, there cannot be the slightest doubt about what that name should be. Personally, I am indifferent about names; practically, I am about as much attached to one of the present societies as the other (whether both are equally attached to me I cannot tell), having been connected with the one about ten years, and with the other almost from its foundation. But politically, I am not fully satisfied with my decision upon this and similar points, until after the Fellows of both Societies have been consulted. Unless the amalgamation of the Societies can be made to promote the study of the science, to enlarge and strengthen all its present appliances, let us, by all means, go on as we are; a generous rivalry is not a great evil. I, for one, as a country Fellow, am not unwilling to pay two subscriptions where one would have done; but I must protest against an old practice in the Ethnological, now reformed, that of receiving the subscription year after year without making any return. I remain, Sir, yours faithfully,

J. BARNARD DAVIS.

Shelton, Hanley, Staffs. Aug. 8, 1868.

ON INTELLIGENCE, AND ITS RELATION TO INSTINCT.*

By M. COUDEREAU.

WHAT is man? This is actually the highest zoological expression; a more complex animal, which, right or wrong, is persuaded that it is more perfect than all the rest.

His existence, like that of all beings in nature, is subjected to external conditions to which he must accommodate himself on pain of perishing.

For him, as for all other beings, this condition of subjection constitutes *his wants*. The wants vary in every creature according to its form and its chemical and organic composition.

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* We have much pleasure in introducing to the notice of our readers the writings of one of the many distinguished French Anthropologists who are as yet little known in this country. We cannot but think that, from this specimen of M. Coudereau's writings, our readers will be glad to know more of him. This paper is translated from the *Bulletins* of the Paris Anthropological Society, and is slightly abridged.—EDITOR.

Every creature is guided towards the means of satisfying its wants by a special faculty which is the corollary of its wants; this is *instinct.* In every creature the instinct varies according to the organic and chemical composition of the individual, according to the form, the functions, the number and the grouping of its organs. Identity of conformation necessarily involves identity of wants and of instinct.

In running through the series of creatures, from the most simple to the most complex, we see that the same organ or the same tissue imparts to the creature, to the formation of which it contributes, the same wants, the same instinct; and that every addition of a tissue or an organ, adds a want or an instinct more to the new animal.

I say "organ or tissue," in fact, in the most simple creatures in which life is scarcely yet manifest, we find only a cell or an agglomeration of cells. The cell is both the whole creature and its sole organ. The manifestation of life is confined to absorption and exhalation—this might be called the cellular instinct.

Other creatures present the cell associated with other tissues, the ciliary filaments, for instance, which endow it with motion. Every new creature is composed of more and more complicated tissues; the fibrous tissue appears, then a rudimentary digestive organ (first a sac with one aperture, then a tube with two apertures), then distinct respiratory organs followed by all other organs. The wants and instincts of each keep pace with the same progression, and the same tissues perform always the same functions. Thus the cell shows itself in every creature, and always with its faculty of absorption and exhalation. In short, I call instinct that organic force, by virtue of which an organ or a tissue performs its functions to satisfy its special wants. The instinct of an animal is the ensemble, or the sum of the instincts of its different organs.

Where does instinct end? where does intelligence begin? It seems to me very difficult to fix the boundary. I shall call intelligence the faculty by virtue of which the animal may, by making use of its will, combine two or more of its individual instincts, for the satisfaction of a want of which it is conscious.

It is in this way, as G. Leroy and M. Toussenel have observed, that animals frequently seem to perform acts by instinct which are certainly due to intelligence. Although in general the term "intelligence" is applied only to man, it appears to me evident enough that both the animal and man possess instinct and intelligence, and in my opinion man could possess no intelligence but on the condition of possessing instinct.

Man is a compound of numerous organs, his faculties are, therefore, a compound of numerous instincts. His organs are more complex than those of any other animal; it must necessarily be the same as regards his wants and his instincts.

It has been observed that the organs of the tissues of the animal economy may be modified according to the use made of them. By causing the muscles frequently to contract, their volume increases ; by leaving them for a long period at rest they diminish in volume, and may, if the inaction is, as in paralysis, indefinitely prolonged, disappear and be replaced by an adipose tissue ; the instinct of the muscle (contraction) not being satisfied induces its destruction.

For the same reason an articulation kept immoveable for a long time may terminate in ankylosis. I am convinced that we could, on the other hand, by imposing upon our limbs certain movements exaggerating the animal muscular effort, not merely greatly modify the existing muscles, but perhaps create new ones.

In persons who by practice develope the agility of their fingers, the divisions of the flexors and tensors are much deeper (especially in musicians), and I have no doubt that under the influence of constant exercise, some muscular fascicles will not merely increase in volume, but will detach themselves from a muscle to become an independent muscle. It is in this way that the proper flexor of the thumb was formed, which does not exist in most apes. What is evident as regards the muscles, holds true with regard to the brain.

Animals in general, and man in particular, may become modified or modify themselves in their organs and their instincts. The physical differences which distinguish man from the animal are striking at first sight, but after due examination the differences appear less important than the resemblances. The organs are the same as those in animals, only modified in form and disposition ; his tissues are exactly the same. From the identity of the nature of all the organs in man and animals, I infer the identity of the nature of the wants, which are the motives of them, and of the instincts which impel them to satisfy them. There are only found more or less pronounced differences in the corresponding instincts, which are always connected with the differences in the physical organs which give rise to them. Man chiefly differs from all other animals by the enormous development of his brain ; and this development is greater still, than appears at first, when we consider that the grey substance, the really active part of the cerebral matter, describes a number of undulations, and covers the convolutions.

The government of the simian tribes greatly contributes to the improvement of the species. The chief is always the best endowed male in his state, as he has only obtained his dignity by his superior prowess, agility, and cunning. The seignorial rights over the fair sex which he claims, make him the veritable father of the fatherland. There is a continual selection and, consequently, progress.

Apart from these conditions of progress, constant and successive, are there other accidental causes? Perhaps so. Certain conditions of hyperæmia, of moderate congestion, by increasing the functions of any portion of the brain, might, in my opinion, accelerate the progress of the species.

What, in fact, is the influence which raises in us certain ideas which persist, despite our efforts to drive them out of our memory? Under what influence become our passions exalted? Are these phenomena simply due to the predominance or action of one convolution or the other? But then, the same passional phenomenon would constantly be produced in each individual, and would, at every moment of his life, dominate all other faculties. Experience, on the contrary, demonstrates to us that under different influences, the various cerebral instincts are put into action by turns.

What, then, is, in the animal economy, the agent which thus transports the dominant action now to one, now to another organ? I look upon the circulation as being this special agent, without attempting to explain this variability of the circulation. I believe it due to reflex action; a sort of reaction which results immediately from an external or internal impression, like that which makes us blush or grow pale, by reacting on the capillary circulation of the face. I base my opinion on the circumstance that, under the influence of a languid circulation, the function of the organs becomes weaker, or may cease altogether. On the contrary, by augmenting the circulation, the action of the organs is also augmented. When, for instance, we are exposed to great cold, the circulation is nearly nil in the fingers; the sensibility diminishes, we can scarcely grasp an object, and even the lips refuse the articulation of sounds. This applies also to the brain. The retarded circulation diminishes the action of the nervous centres, and this diminution may lead to syncope.

The augmentation of the circulation exaggerates the action of the cerebral faculties. Excess may induce delirium; beyond this, apoplexy may ensue. The morbid afflux of the blood to the convolutions determines, according to the condition in which it takes place, delirium, mania, insanity, apoplexy. Confined within the limits of health, it may give rise to genius. The richness of the capillary net in several parts of the brain is an element which, in my opinion, has not sufficiently been taken into account in the study of the nervous centres, and which ought to have a place by the side of the development of the convolutions and the measurements of the crania.

As already stated, cerebral gymnastics tend to increase the volume of the convolution exercised; but that which precedes and determines the augmentation of the volume, is the greater action of the local circulation, a greater richness of the capillary net. In the adult the cranial parietes resist the development of the convolution, and the progress may confine itself to the augmentation of the vascular net, and terminate only in the augmentation of the volume in the descendants, inheriting the paternal active circulation, and in whom the flexible parietes of the cranium will permit the consequent development.

I consider, in our first parents, as an agent of progress, every cause tending to enrich the capillary net of the brain, and thus to increase momentarily or constantly the circulation.

I have said that man had to create his language; he was also obliged to extend it in order to express his ideas in proportion as they increased. But man is not alone in possessing a language. All species of animals possess one, varied, but sufficient to express their ideas. Most of them possess only the cry; but they give to it, according to circumstances, and according to what they wish to express, a special character. They vary the *timbre*, repeat, shorten, or lengthen the sounds. They also possess gesture; showing, by their attitudes, what they have to say. And animals of the same species always understand each other.

Allow me to analyse, for a moment, the language of a member of our poultry-yard. When a certain number of pullets peaceably feed together, scratching the soil, you hear a monotonous chirping, a series of incoherent co-co-cos, which remind one of the tittle-tattle of old gossips. But now the breakfast hour draws nigh. The first which feels hungry raises its voice; every syllable uttered is followed by a special rolling. Its companions understand the call, and make a chorus; and all proceed to the habitation of their mistress, loudly proclaiming their wants. A bird of prey hovers above them. They emit a long cry—the cry of fear. Soon another cry is heard, as long, but more acute than the first—it is the cry of pain. The bird of prey has seized one, and carries it off. At another time you hear a festive cry; the hen has laid an egg. You may hear this song also in another diapason. It is the sound of anger, of indignation; the hen finds her nest occupied by a rival, *inde iræ.*

The hen now becomes a brooder; she understands all the duties of maternity. She likes even her future progeny, and speaks to it in a language she never used before. It is now a cluck. When, for a moment, she quits her eggs to take food, she returns as soon as possible, her cluck is a busy cluck, and she picks away at her companions, who would make her lose time; but her companions understand her reasons and respect them. The chickens are now hatched. The cluck is louder, prouder; it says, "I am a mother!" She calls her brood. A dog now approaches; the cluck becomes rapid, telling her chickens that there is danger and that they should run. Her cry thus varies in character, according to the imminence of the peril, from a simple admonition to extreme terror.

When she finds a choice morsel, she breaks it with her bill, and calls her young with a peculiar cluck which they well understand. The cock invites his hens with a similar cluck to partake of some dainty. Here we have a whole vocabulary, sufficing for the wants of the species, by means of which they are able to communicate all the ideas conformable with their nature.

Each animal species possesses a language related to its mode of life and its instincts. Their language consists both of voice and of gesture. The language of gesture is still more extensive than that of voice, especially in the higher animals; and when they find themselves placed in a new and unknown condition, they use gestures in order to express the idea.

The dog, that faithful companion and intelligent friend of man, does he not by his expressive gestures make known to us what he wants? Let us observe him in moments of joy; how expressively does he manifest the pleasure of seeing his master after a long absence! what rejoicing in his bark, his bounds, his caresses! What eloquence is there not in his attitude, his profound grief, when his master is angry with him! I cannot but repeat that popular (not vulgar) phrase, he only wants speech. The play of the physiognomy, which with gesture constitutes mimics, plays a certain part in the language of animals. Concentrated in the action of skin, muscles, which are, much more than in man, developed in the whole surface of the body; then in the contractility of the iris, the muscles of the eye, the eye-lids and eye-brows, it extends to the nostrils and the lips (ruminants and solipeda); the movements of the upper lip are much more extensive in the felidæ and canidæ. The contraction of the superior lip and the nostrils expresses, as in man, anger and defiance. In the dog, especially hunting dogs, we perceive a rudimentary smile; the ape apparently laughs.

Every animal thus possesses a language sufficient to express its ideas, not merely to individuals of the same species, but to animals of a different species. Those who have no organs of voice, make themselves understood by mimicry (bees, ants). In man the action of the skin muscles chiefly shows itself in the face. This mode of expression being thus concentrated in one locality, is stronger in him, but he does not possess it exclusively. It is more developed in civilised people; savages are remarkable for the impassibility of their features.

It has often been repeated that man alone is in possession of what has been called speech, and that this character alone is sufficient to distinguish him from animals; this is prejudice, which falls to the ground before sound observation. First of all, it is false that speech is due to an innate instinct of man; he does not naturally possess speech, that is to say articulate language; he has the capacity of acquiring it, that is all. If it were otherwise, there would be but one language for all men. He speaks because he hears others speak, and he imitates their sounds; individuals born deaf do not speak, because they have no model to imitate. The faculty of speaking is thus simply one of the manifestations of the faculty to imitate. Does this faculty of imitating articulate sounds belong exclusively to man? No, he shares this faculty with other animals (magpie, raven, parrot, starling, &c.); we only possess this faculty in a higher degree, as is the case with all the faculties which constitute what we call "his intelligence."

A tribe of apes more advanced than the rest in the way of progress, the individuals composing it became men, and, under the pressure of necessity, acquired, by the sole force of their will and their labour, that which they had not received from nature; speech was thus one of their first conquests. In order to account for the intellectual development of the new-born humanity, I sought for a starting point in humanity as it exists, in order to proceed from the known to the unknown. I took as a term of comparison the intellectual development of the infant. Before becoming a man the infant is an animal; it is the work of nature before becoming the product of civilisation. Nature has created it the equal of all other animal creatures; as to all other animals, nature has endowed it with organs, wants, and instincts. As to all others, nature has given it a language—not speech, but the cry which it manifests almost before it is quite born. From that moment it feels a want which it expresses by a cry; its wants are not many at first, to suckle and to sleep. They multiply by degrees, wants to see, to move, to grasp objects; all these wants and desires are still expressed by cries. These cries become modified, for the child listens and imitates; he at first imitates the intonations of the words, which he cannot yet articulate. He only, at a later period, very gradually, and with much trouble, succeeds in pronouncing some scarcely intelligible words; when about ten or twelve months old, the infant articulates distinctly papa, mamma; when two years old, he can, more or less, distinctly enunciate a phrase, but it is only in the third or fourth year that the child can be said to speak, and in order to obtain this result his desires must be excited, which are not satisfied until he pronounces a syllable, or a word; and every syllable, every new word is only acquired by great efforts, not merely on the part of the child but even in the adult. I appeal to all those who in learning a foreign language come to pronunciations unknown in their native language. At last all difficulties are overcome, the child speaks, " he can say everything," as the nurse has it ; but with such patience and care, and in so long a time, a parrot might nearly learn as much.

In the child on the road to learn to speak, there is a motive which impels him, which is his wants. The first words he pronounces are the names of persons who only study his wants, namely papa, mamma. It requires the ear of a mother to understand the musical thoughts of her child before he expresses it in articulate words. Time progresses, and the child studies, works, and becomes a man, and, like the greater part of men, after a life of work and study, each assimilates according to the sphere of his aptitudes, a portion of the requisitions of humanity. But we must not forget that new conquests are rare ; most men, at all events, arrive at the term of their existence, having passed it like apes and parrots ; they have imitated acts and words ; imitated nothing more. Infant humanity could not have proceeded otherwise than the infant man proceeds now in the acquisition of speech. The progress then was infinitely slower, this seems the chief difference to note.

A simian tribe occupies the highest degree of the zoological scale; the convolutions of the posterior lobe of the brain have become developed, and with it the love of family. The frontal convolutions have also expanded and have enlarged the intellectual horizon. The animal has become more observant and more imitative, the modification of the organs induced the modification of wants.

The instinct of society and the instinct of observation have become developed, and created the want of communicating to each other the results of the observations and sensations. Cries and gestures were no longer sufficient, and the creation of better means became a necessity.

The primitive man, did he, as some linguists believe, possess "a language formed all at once, issued instantaneously from the genius of each race?" This proposition seems to me inadmissible; I do not think that speech is the result of "a primitive intuition," nor that in every language "grammar is a primitive fact," beyond which we cannot ascend. I do not purpose examining here the question of language from a linguistic standpoint, as this science does not appear to me capable of solving the problem as I put it.

Before the creation of the languages, which linguists have studied, analysed, and compared, there must, during many centuries, have obtained a condition about which we possess no data. We can only ascend to the cradle of language by " legitimate inductions," and as we are obliged to have recourse to hypothesis, I ask permission to say what appears to me most probable.

The primitive man, observing the cries and gestures of animals within the field of his observation, interpreted the sense of them and imitated them to express analogous ideas. He heard different sounds of nature (of wind, thunder, rain, &c.), and translated, by a more or less perfect imitation of this noise, the impressions analogous to those he felt. The first language must have been mimicry and imitative music (Renan, *Origine du Langage*). How did man pass from this form of language to articulate speech? It must have occurred to him naturally, gradually to articulate all the sounds whilst attempting to imitate all the noises that struck his ear. The imitation of the cry of the animal became the name of that animal. The first words must have been nouns only; then by the extension of the sense or the character of the animal or of a thing, the same word became a substantive noun or an adjective, according to circumstances, with a simple shade perhaps in the pronunciation or in the gesture. The verb was subsequently formed in the same fashion by a slight modification of the primitive substantive.

The child does not proceed otherwise in the fabrication of a word he wants to communicate his impressions; in his language "burn" and fire are synonymous, and frequently employed indiscriminately; and so it is with the rest of his vocabulary.

When usage adopted conventional sounds for conventional objects, the primitive imitation of natural sounds was gradually abandoned, and the starting point lost.

How is it that all languages, though of a similar origin, differ so much? The reason is very simple. The same animal has generally different cries, and modifies its cries according to circumstances; each tribe gave it a name by imitating one of these modifications, whence profound differences resulted. Every primitive tribe was composed of a small number of individuals; there must therefore have been an incalculable number of primitive languages. At a later period these tribes communicated with each other; alliances and conquests caused some languages to disappear, whilst such as survived became enriched; and since the beginning the number of languages diminishes like the number of peoples, but each language becomes enriched by a number of expressions borrowed from the language to whose disappearance it has contributed; this will no doubt continue until humanity will constitute but one people, speaking the same language. In short, articulate language in man is neither an innate nor an exclusive faculty. According to G. Leroy, animals also possess an articulate language, without which they could not combine for certain acts, such as the relays in hunting animals (wolf). Man acquires the faculty of speech by his memory, labour, and imitation—the parrot does no more. From a linguistic stand-point, this faculty is in its nature identical in man and animal. Man expresses his ideas by the aid of a language he has made his own; all animals do the same. He can articulate sounds; other animals can imitate sounds as well as he can. He presents simply in this respect a greater development of a faculty *common* to all social animals.

ON THE CRANIA AND BONES OF LES EYZIES; OR, THE ANCIENT CAVE-MEN OF PERIGORD.*

By Prof. **Paul Broca**, Secretary-General of the Anthropological Society of Paris, and Honorary Fellow of the Anthropological Society of London.

No discovery could offer more interest to Anthropology than that of these bones. It is the complement—one would almost say the crowning work—of the important discoveries which Mr. Lartet, sen., and his much lamented fellow-labourer, M. Christy, made four years ago in the caverns of Perigord. The numerous objects found in these caverns have not only furnished to us the most incontestible and striking proofs of the contemporaneity of man with the mammoth, but they have revealed to us the most curious details of the life and customs of the ancient cave-men of Perigord. The anatomical characteristics of the intelligent and artistic race, whose admirable carvings and sculptures are to us a subject of astonishment, yet, however, remain to be disclosed to us. The latest researches in Les Eyzies cave, by M. Lartet, jun., permit us now to bridge this gap. No doubt can be raised as to the authenticity and high antiquity of the bones which these researches have brought to light. The stratigraphical details furnished by this gentleman, prove not only that they are as ancient as, but that they are even more ancient than the carved objects of the great cavern of Les Eyzies; the latter correspond to the epoch in which the reindeer was already predominant among the fauna, while the former seem to approximate rather to the time of the mammoth; and although a very long period between these two epochs might have elapsed, we are compelled to believe that the passage from one to the other took place gradually, without any ethnographical revolution; that the same race remained without interruption in the same place; and that, if the bones which we are about to examine, are not those of the *artistes* of the reindeer period, they are at least those of their ancestors. The remains of quaternary man that we

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* This article is the most important part of a long Memoir by Prof. Broca, which will appear in Lartet's and Christy's *Reliquiæ Aquitanicæ*.